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Original Research Article

Clinical profile in cases of intestinal perforation

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ABSTRACT

Background: Intestinal perforation is a surgical emergency with a wide variety of clinical features and causes. Regional variations are common with regards to the cause of intestinal perforation, and need to be evaluated in local settings. The study was conducted to determine the clinical profile of patients with intestinal perforation, with regard to clinical presentation, investigative results, pathological features, surgical findings, complications and outcome.
Methods: Detailed information was recorded on 40 cases of intestinal perforation with regard to clinical features, investigative results, surgical findings, post-operative course and outcome. The data was analysed with appropriate statistical methods.
Results: The site of perforation was gastric 27.5%, duodenum 20%, jejunum 5%, ileum 35%, appendix 10% and colon 2.5%. Main causes included peptic ulcer 42.5%, typhoid 25% and few cases of trauma, tuberculosis, appendicitis and malignancy. Peritonitis was universal. Primary repair, resection with anastomosis, appendectomy and stoma were the operative procedures. Morbidity rate was 60.0% and mortality rate was 12.5%.
Conclusions: Commonest site of perforation was gastro-duodenal while commonest cause was peptic ulcer disease. Morbidity and mortality was comparable with other studies.

Keywords: Gastro-duodenal, Morbidity, Mortality, Perforation, Peptic ulcer disease

INTRODUCTION

Intestinal perforation is one of the most serious and frequently encountered surgical emergencies. It presents as acute abdomen and requires urgent exploratory laparotomy and corrective surgery. Out of all emergency surgical hospital admissions due to acute abdomen, the prevalence of intestinal perforation could be up to 20-40%.[1] The diagnosis is clinically obvious in many cases, though radiological confirmation is invariably sought before surgical intervention. The morbidity and mortality is adversely affected by several factors pertaining to delay in seeking treatment, poor clinical condition at admission, type of perforation and complicating features. A wide range of pathologies can damage both small and large intestines. Clinically, such patients may present with features of acute intestinal obstruction or perforation. Intestinal obstruction often but not necessarily precedes perforation. Gastrointestinal tract perforations can occur for various causes such as infective etiology, peptic ulcer, inflammatory disease, blunt or penetrating trauma, iatrogenic factors, foreign body or a neoplasm, requiring an early recognition and, often, urgent surgical intervention.[2]

The underlying etiological factors of intestinal perforation vary between developed and developing countries. Infectious diseases like typhoid, tuberculosis and HIV infection are the common causes in the developing countries whereas non-infectious conditions like malignancy and diverticulitis are more common in developed nations.[2] The site of intestinal perforation depends on the underlying pathology. Perforation in the duodenum or stomach is a serious complication of peptic

ulcer disease. On the other hand, typhoid perforation generally involves the terminal ileum. Colonic diverticular disease, increasing with aging, may experience severe complications including perforation and peritonitis in a minority of patients (15%). Numerous drugs have adverse effect on the mucosa and increase the risk of perforation, particularly NSAIDS, corticosteroids, opioids and calcium channel blockers.[3]

Intestinal injury is frequent after non-penetrating abdominal trauma. The cause and type of trauma naturally varies from place to place. Road side accidents are also common in our country. Injury to the intestine and perforation has been found in 5-16% of patients undergoing laparotomy after blunt abdominal trauma.[4]

Appendicular perforation is not an uncommon entity, occurring distal to an occluding fecolith which leads to acute inflammation. Gangrene and rupture of the appendix filled with pus rapidly results in local peritonitis.

METHODS

This study was conducted prospectively in the Department of General Surgery of Maharishi Markandeshwar Institute of Medical Sciences and Research, Mullana, on forty patients. Cases were enrolled on basis of random numbers. Consent was obtained and then included in the study. The demographic data pertaining to age, gender, residence and occupation were recorded. Detailed history of present illness and treatment received was noted along with past, family and personal history. Present complaints included reference to abdominal pain, vomiting, fever, trauma, abdominal distension, constipation, dyspepsia, loss of weight, jaundice, and any other symptoms. Attempt was made to determine the etiology of perforation and time interval between the event and presentation to the hospital. History of smoking, alcohol intake, drug intake and food habits was noted. Past history of diabetes, hypertension, tuberculosis, jaundice and previous surgeries was also noted.

Detailed physical examination was duly recorded. General physical examination pertained to clinical condition of the patient with special reference to dehydration and shock. Note was made of build, nourishment, pallor, icterus, lymphadenopathy, edema, clubbing, cyanosis, respiratory rate, temperature, pulse and blood pressure. In systemic examination, particular note was made of abdominal findings related to clinical signs of peritonitis and perforation. Examination details included distension, scars, visible mass and pulsations on inspection; tenderness, guarding, rigidity, palpable mass, organomegaly, distention and fluid thrill on palpation; shifting dullness and obliteration of liver dullness on percussion and bowel sounds on auscultation. Hernial sites, gentalia and rectal examination findings were included. Note was made of examination of respiratory, cardiovascular and central nervous systems.

Enrolled patients were investigated as indicated for evaluation of the clinical status, confirmation of perforation, etiology thereof and complications suspected or observed. Laboratory investigations were carried out as per clinical relevance, including hemogram, blood sugar, electrolytes, renal function tests, liver function tests, blood culture, Widal, urine examination, erect and supine abdominal x-ray, ultrasonography and other investigations as required.

The number, size and location of perforation was recorded and operative management noted. Post-operative analysis was done. Any complication if present was noted.

The data collected in respect of various variables were statistically analysed. Mean and Standard Deviation were computed for the quantitative variables. Frequency and percentages were calculated for qualitative variables. Chi square test was applied to analyse the association between attributes. Z test of proportion and analysis of variance (ANOVA) was applied to see the difference between means of group(s). The data were recorded on Microsoft excel. The analysis was performed by using software SPSS 20.0. A p value <= 0.05 was considered as significant.

RESULTS

Age and sex distribution

The majority of the cases, 30 (75.0%) were males while only 10 (25.0%) were females, with a male:female ratio of 3:1. The age of the patients ranged from 18 to 70 years with a mean of 37.63±14.26 years.

Table 1: Age and gender wise distribution of patients.

Age (years)	Gender				Total (N = 40)	
	Male (n = 30)		Female (n = 10)			
	n	%	n	%	n	%
≤19	2	6.7	2	20.0	4	10.0
20-39	12	40.0	7	70.0	19	47.5
40-59	13	43.3	1	10.0	14	35.0
≥60	3	10.0	0	0.00	3	7.5

Chi square = 6.135; p = 0.105; non-significant.

Table 2: Mean age of patients.

Gender	n	Mean±SD
Male	30	40.53±14.78
Female	10	28.90±8.07
Total	**40**	**37.63±14.26**
p value		0.023; significant

The mean age of males was 40.5±14.8 years, while that of females was 28.9±8.1 years, and this was statistically significant (p=0.023). The maximum number of cases was in the age group of 20-39 (47.5%) while the least number was in the age group of ≥61 (7.5%).

Site and characteristics of perforation

The site of perforation was ileum 35.0% gastric, 27.5% and duodenum, 20.0%, gastro-duodenal 47.5%. Perforation of appendix and large intestine were less common. Gastric and duodenum perforations were mainly in males, 94.7% whereas at the other sites males were 57.1%. Age distribution showed that there was no statistical difference between site of perforation and various age groups.

Table 3: Sex distribution in relation to site of perforation.

Site of perforation	Gender				Total (N = 40)	
	Male (n = 30)		Female (n = 10)			
	n	%	n	%	n	%
Gastric	11	36.7	0	0.00	11	27.5
Duodenum	7	23.3	1	10.0	8	20.0
Jejunum	0	0.00	2	20.0	2	5.0
Ileum	10	33.3	4	40.0	14	35.0
Appendix	2	6.7	2	20.0	4	10.0
Colon	0	0.00	1	10.0	1	2.5

Table 4: Age distribution in relation to site of perforation.

Site of perforation	Age (years)								Total (N = 40)	
	≤19		20-39		40-59		≥60			
	n	%	n	%	n	%	n	%	n	%
Gastric	1	25.0	4	21.1	4	28.6	2	66.7	11	27.5
Duodenum	1	25.0	3	15.8	4	28.6	0	0.00	8	20.0
Jejunum	1	25.0	1	5.3	0	0.00	0	0.00	2	5.0
Ileum	1	25.0	8	42.1	5	35.7	0	0.00	14	35.0
Appendix	0	0.00	2	10.5	1	7.1	1	33.3	4	10.0
Colon	0	0.00	1	5.3	0	0.00	0	0.00	1	2.5

The exact location of perforation at different sites show a wide area of involvement. However, in gastric perforation the majority were in the pre-pyloric region (9 out of 11 cases, 81.8%). Similarly, most of the perforations in the duodenum were in the 1st part (6 out of 8 cases, 75.0%). Ileal perforations were widely distributed but were more in the terminal ileum within 30 cm from the ileo-caecal junction (8 out of 12 cases, 75.0%, in single perforations).

Almost all the cases in the present series had a single perforation (37 cases, 92.5%). Two or more perforations were seen in only 3 cases of ileal perforation, including a case with 2 perforations and another two cases with multiple perforations.

The size of perforation was small, less than 1 cm maximum diameter, in 14 cases (35.0%) while it was of medium size, i.e. 1cm to less than 2 cm, in another 13 cases (32.5%). Large perforation of 2 cm or more was noted in 13 cases (32.5%). The size varied with the site of perforation. Gastric perforation was small in almost half of cases, 45.5% (5/11) compared to ileum where small perforations constituted only 14.3% (2/14). Most of the large perforations ,53.8% (7/13) were in the ileum.

Table 5: Location of perforation at different sites.

Location of perforation	No. of cases
Stomach	
Antrum	1
Anterior wall	1
Pre-pyloric	9
Duodenum	
1st part	6
2nd part	1
3rd part	1
Ileum (distance from IC junction)	
<10 cm	3
10-30 cm	5
>30 cm	4
Multiple	2
Large intestine	
Ascending colon	1

The common symptoms in cases with intestinal perforation were consistent with the typical complaints or abdominal pain, vomiting, constipation and abdominal distension in various combinations. The commonest chief complaint was acute abdominal pain which was seen in as many as 95.0% (38) cases, leaving only 2 cases with

trauma who had other overwhelming presenting features. Nausea/vomiting was reported in 20 cases (50.0%) while obstipation and abdominal distension was complained of in 11 (27.5%) and 12 (30.0%) patients respectively.

Table 6: Co-morbidities.

	No. of cases (N = 40)
Hypertension	4
Old tuberculosis	6
Diabetes	1
Compartment syndrome	1
Acromegaly	1
Bilateral renal calculi	1
Cholelithiasis	1
PU junction calculi, hydronephrosis	1
UTI	1
Tenia corporis and cruris	1
Hepatitis B positive	1
Forehead and knee wound	1
Epistaxis	1

Fever was reported by 12 patients including those with underlying typhoid infection. There was wide range of duration of abdominal symptoms before the patients presented to the emergency department of the hospital, ranging from less than 24 hours to 15 days. Symptom duration was rather evenly distributed in the time groups of ≤1 day, 2-3 days, 4-7 days and ≥7 days. More than half the cases presented beyond 4 days (21 cases, 52.5%) including 10 cases (25.0%) beyond 7 days. The duration of symptoms prior to admission varied with the site of perforation, being the shortest with gastric perforation; 63.6% (7/11 cases) had less than 24 hours of symptoms and as high as 81.8% (9/11) within 3 days prior to admission. Conversely, in ileum perforation the vast majority of cases, 85.7% (12/14) had abdominal symptoms of more than 4 days. Three of the 4 cases of appendicular perforation had symptoms over 7 days predisposing to this complication of acute appendicitis. The vital signs at time of admission were noted. Tachycardia with pulse rate >100 / min was observed in 52.5% (21 cases) and tachypnoea with respiratory rate >20 / min in 12.5% (5 cases). The majority of patients were afebrile at the time of admission. Hypotension requiring active resuscitation was observed in 22.5% (9 cases) while 12.5% (5 cases) were hypertensive. The mean vital signs in patients with different sites of perforation showed a similar range suggesting that particular sites of perforation was not significantly associated with specific alteration in the vital signs.

Table 7: Site of perforation in relation to etiology.

Site of perforation	Etiological factors						Total (N = 40)
	Gastric (n = 11)	Duodenum (n = 8)	Jejunum (n = 2)	Ileum (n = 14)	Appendix (n = 4)	Colon (n = 1)	
Peptic ulcer	10 (62.5)	7 (43.8)	0	0	0	0	17 (42.5)
Typhoid	0	0	0	10 (100)	0	0	10 (25.0)
Trauma	1 (33.3)	1 (33.3)	0	1 (33.3)	0	0	3 (7.5)
Tuberculosis	0	0	2 (100.0)	0	0	0	2 (5.0)
Appendicitis	0	0	0	0	4 (100)	0	4 (10.0)
Malignancy	0	0	0	0	0	1 (100)	1 (2.5)
Volvulus	0	0	0	1 (100)	0	0	1 (2.5)
Non-specific infection	0	0	0	2 (100)	0	0	2 (5.0)

Figures in parentheses indicate percentages

The typical physical signs of intestinal perforation, accompanied by peritoneal fluid collection viz. Abdominal distension, tenderness, guarding and rigidity, absent bowel sounds and free fluid in the abdominal cavity were elicited in all cases. The vast majority, 87.5% (35 cases) had air detected under the diaphragm in the chest radiograph. Abdominal ultrasound revealed free fluid in the abdominal cavity and pelvis. The clinical and radiological diagnosis of perforation was thus clear in all the 40 patients. Co-morbidities unrelated to the presenting ailment of intestinal perforation were seen in some of the patients. The commonest was old tuberculosis not associated with perforation, in 6 cases (15.0%) followed by hypertension (4 cases, 10%).

Etiology of perforation

The etiological background dictated the site of perforation. Peptic ulcer disease was the cause of perforation in 42.5% (17 cases) involving the stomach in 10 cases and duodenum in 7 cases. Typhoid accounted for 25.0% (10 cases), all in the ileum. Acute appendicitis resulted in perforation of the appendix in 4 cases (10%) while trauma and tuberculosis accounted for 3 and 2 cases respectively. There was 1 case each with

malignancy and volvulus. Two cases had non-specific infection.

Operative management

The operative procedures included primary repair of the perforation, resection with anastomosis, stoma (ileostomy or jejunostomy) or appendectomy depending on the clinical indication. Primary repair was carried out in 23 cases (57.5%) while resection anastomosis was done in 4 cases (10.0%). Stoma was created in 9 cases (22.5.0%) including 8 with ileostomy and 1 with jejunostomy.

All the cases of gastric and duodenal perforation had primary repair. Ileal perforations in the 14 cases needed primary repair, resection and anastomosis or ileostomy in 3, 3 and 8 cases respectively. The 4 cases with appendix perforation had appendectomy but one of these had resection of adjacent gut due to gangrene.

Table 8: Age distribution in relation to etiological factors in perforation.

Site of perforation	Age (years)								Total (N = 40)	
	≤19		20-39		40-59		≥60		N	%
	n	%	n	%	n	%	n	%	n	%
Peptic ulcer	2	50.0	5	21.1	8	57.1	2	66.7	17	42.5
Typhoid	0	00.0	7	42.1	3	21.4	0	0.00	10	25.0
Trauma	0	0.00	2	10.5	1	7.3	0	0.00	3	7.5
Tuberculosis	1	25.0	1	5.3	0	0.00	0	0.00	2	5.0
Appendicitis	0	0.00	2	10.5	1	7.1	1	33.3	4	10.0
Malignancy	0	0.00	1	5.3	0	0.00	0	0.00	1	2.5
Nonspecific infection	1	25.0	0	0.00	1	7.1	0	0.00	2	5.0
Total	**4**	**100**	**19**	**100**	**14**	**100**	**3**	**100**	**40**	**100**

Complications

The overall morbidity rate, inclusive of all complications and post-operative problems, was 60.9%, i.e. 24 cases had one or more such morbidities. Post-operative wound complications occurred in 14 cases (35.0%) in the form of local infection, out of whom 6 developed wound dehiscence. Two of these progressed to burst abdomen. Other morbidities that occurred in the post-operative period were in the form of systemic complications, the most frequent of which was respiratory (12 cases, 30.9%). The age distribution in cases with complications was wide. Wound infection occurred in 2/5, 7/20, 3/12 and 2/3 cases in the ≤ 19, 20 -39, 40 - 59, and ≥ 60 years age groups respectively. Other complications were also widely distributed in the different age groups.

Table 9: Complications and morbidities.

Post-operative complications	Number*	Percentage (N= 40)
Wound infection	14	35.0
Wound dehiscence	6	15.0
Burst abdomen	2	5.0
Respiratory complications	12	30.0
Renal complications	5	12.5
Cardiac complications	8	20.0
Confusion / delirium	4	10.0

The operative procedure did not appear to have any relationship with the incidence of complications, which were widely scattered in the various groups, and it was not possible to establish any relationship of wound complications or systemic complications with the type of surgery performed.

Outcome

The mortality rate in this study was 12.5% (5 cases). Of the deaths, 3 occured in patients with ileal perforation. One case had gastric perforation and another had complicated appendicitis with extensive gangrene and sepsis. All these patients expired within 7 days of admission and 3 of the 5 cases expired within 3 days indicating the serious clinical condition at presentation

DISCUSSION

Age and sex distribution

The majority of the cases were males, with a male:female ratio of 3:1. The male preponderance has been uniformly reported especially from the developing world, with wide variation of 3.3:1 to 9:1.[5,6] The age of the patients in this study ranged from 18 to 70 years with a mean of 37.6±14.3 years. The mean age of males was higher than that of females, and this was statistically significant (p=0.023).

Site and characteristics of perforation

The site of perforation in this study was ileum, in 35.0%, gastric, 27.5% and duodenum, 20.0%. Perforation of appendix and large intestine were less common. Gastric and duodenum perforations were mainly in males, 94.7%, whereas at the other sites males constituted 57.1%. In a retrospective analysis of 250 patients with peritonitis over a decade at a referral surgical unit in New Delhi, Dorairajan et al also revealed that perforations of the upper gastrointestinal tract occur in the majority unlike the west where perforations of the lower gastrointestinal tract predominate. Batra et al found that the site of perforation was gastroduodenal, small bowel, appendix, colon, rectum in 80.3%, 14.1%, 3.8%, 1.3% and 0.6% respectively.[7,8]

Almost all the cases, 92.5%, had a single perforation. Two or more perforations were seen in only 3 cases out of the 14 cases of ileal perforation, i.e. 78.6% of ilealperforations were single. This is consistent with the observation of Freeman, who studied 41 cases of ileal perforation and found that the majority of cases, 78%, had a single perforation.[9]

Clinical features

In this study the common symptoms were consistent with the typical complaints or abdominal pain, vomiting, constipation and abdominal distension in various combinations. The commonest chief complaint was acute abdominal pain which was seen in as many as 95.0% cases, leaving only 2 cases with trauma who had other overwhelming presenting features. Nausea/vomiting was reported in 50.0% while obstipation and abdominal distension was complained of in 27.5% and 30.0% patients respectively.

The typical physical signs of intestinal perforation, accompanied by peritoneal fluid collection viz. abdominal distension, tenderness, guarding and rigidity, absent bowel sounds and free fluid in the abdominal cavity were elicited in all cases.

Etiology of perforation

Peptic ulcer disease was the cause of perforation in 40.0% involving the stomach in 10 cases and duodenum in 7 cases. Typhoid accounted for 27.5%, all in the ileum. Acute appendicitis resulted in perforation of the appendix in 10% while trauma and tuberculosis accounted for 3 and 2 cases respectively. There was 1 case each with malignancy and volvulus. Two cases had non-specific infection.

These studies find the ileum to be the most common site of involvement. The distribution in western countries showing a predominance of lower gut perforation appears to be a reflection of decreasing incidence of peptic ulcer disease and resultant perforation of duodenum and stomach.Typhoid, the major cause of ileum perforation in countries like India, is hardly a cause in the West. On the other hand, malignancy, particularly of the large intestine, emerges as a common cause of perforation in the latter.

Operative management

The operative procedures included primary repair of the perforation, resection with anastomosis, stoma (ileostomy or jejunostomy) or appendectomy depending on the clinical indication.

Complications

Post-operative wound complications occurred in 35.0% in the form of local infection, out of whom 6 developed wound dehiscence. Two of these progressed to burst abdomen. Other morbidities that occurred in the post-operative period were in the form of systemic complications, the most frequent of which was respiratory 30.9%. The age distribution in cases with complications was wide. The overall morbidity rate was 60.0% which is a relatively high figure and is partly contributed to by poor pre-operative general condition. Agarwal et al reported that major complications occurred in 25% of 260 operated cases, including burst abdomen in 11%, leak in 5%, intraabdominal abscess in 5% and multi-organ failure in 6.5% cases. In a study of 59 patients with large bowel perforation and peritonitis undergoing emergency surgery, Bielecki et al found that major complications were wound infection and dehiscence.[5,12]

Mortality

The mortality rate in this study was 12.5%.Gupta and Kaushik analyzed studies dealing with overall spectrum of secondary peritonitis in various countries of the Eastern region and reported an overall mortality ranging from 6% to 27%. Mortality overall rate of 22.1% was found in a study from Africa on peptic ulcer perforation.[12,13]

In Indian studies, a large series of 260 cases by Agarwal et al10 reported an overall mortality of 10%, while it was found to be 7% in a retrospective study on 400 patients by Bali et al, 11.5% of 260 cases by Shrestha et al and 13% out of 77 cases by Yadav et al.[10,13,15]

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